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CURTIS

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50149 Rev. A. 09/06

EV & HYBRID VEHICLE PRODUCTS

CURTIS

EV AND HYBRID

PRODUCTS BY INDUSTRY

		Model Number	Golf	Material Handling	Aerial Work Platforms	Sweeper/ Scrubber	Light On-Road	Ground Support Equip.	Utility	Military	Page
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Programmers	Handheld programmer	1311	•	•	•	•	•	•	•	•	6
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	24-36 V, 400-500 A / 36-48 V, 350 A / 48-80 V, 300 A	1236		•	•	•	•	•	•	•	8
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INTEGRATED TECHNOLOGY

Curtis is well known worldwide as the electric vehicle electronics expert since 1960.

Flexibility, functionality and performance are the foundations of the Curtis systems approach.

Complete, unified system solutions linked by industry-standard CAN communications.

ELECTRIC AND HYBRID VEHICLE SYSTEMS

Alarms and Beacons

High-quality, durable, affordable alarms and beacons ensure safe vehicle operation and regulatory compliance.

Programmers

Programming of Curtis products is easy with an ergonomic, menu-driven universal handheld unit or a PC-based programming station.

Battery Chargers

Curtis' high-efficiency, switch-mode chargers are field-programmable and portable.

DC Contactors & Emergency Disconnect Switches

Curtis offers a wide-ranging line of Curtis/Albright DC Contactors and manual Emergency Disconnect Switches.

Input Devices

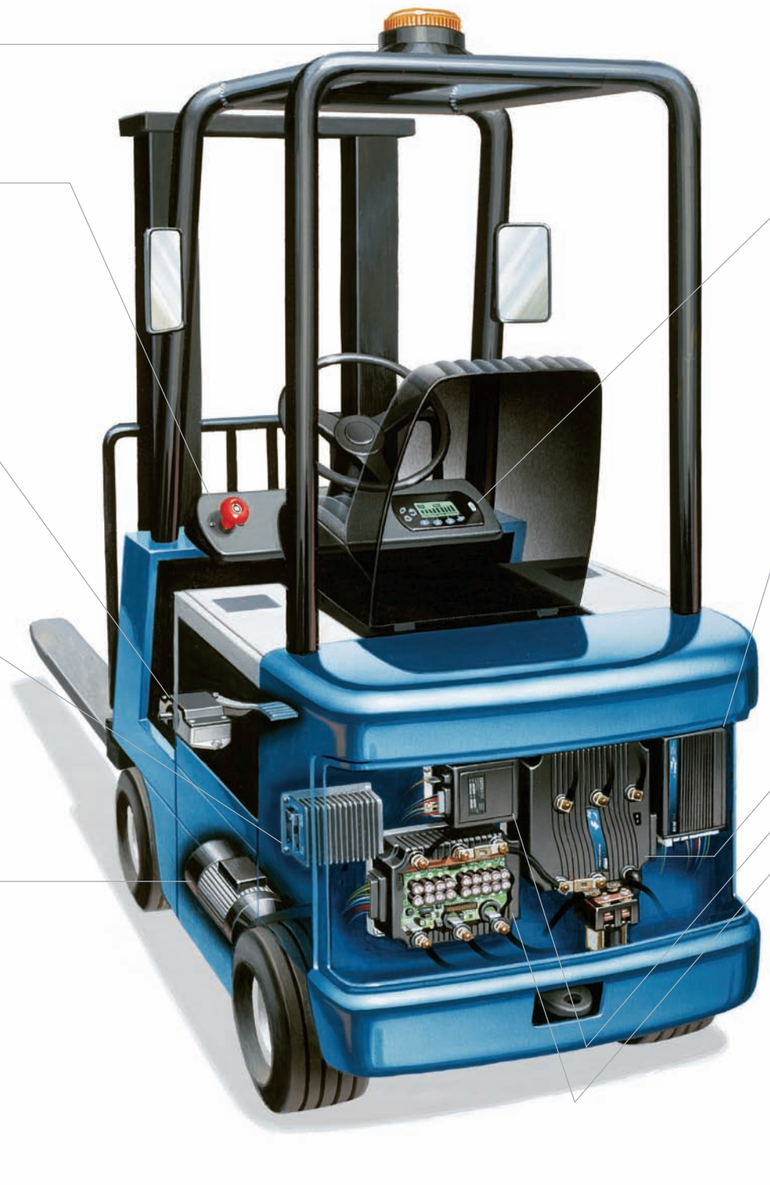
Extensive selection of electronic and electromechanical input devices including: foot pedals, throttles, potentiometers, temperature and pressure senders.

DC/DC Converters

Curtis DC/DC Converters provide high-efficiency voltage regulation and safe, isolated operation with an unmatched field record of reliability.

Electric Motors

While Curtis does not market electric motors, we work in close cooperation with major motor manufacturers to integrate our products with the latest motor technology.



Instrumentation

Curtis offers the most extensive instrumentation product line of fully customizable and programmable gauges and panels in the electric vehicle industry.

Vehicle Management System

The Curtis Vehicle System controller works as a stand-alone system I/O controller or in conjunction with Curtis CAN-based devices as a single point "Master" control of multiple vehicle functions.

Traction Controllers

Steering Controllers

Lift Controllers

Curtis has set the standard for decades, leading the EV industry in innovation, quality and reliability. Curtis provides exceptionally smooth control and safe operation of AC Induction, Separately Excited, Series and Permanent Magnet motors.

MOTOR SPEED CONTROLLERS

Always in Control

- You can depend on Curtis controllers mile after mile, load after load.
- Unprecedented flexibility, programmability and system intelligence
- Millions of Curtis controllers are installed in electric vehicles all over the world.

Precision You Can Trust

- Smooth, precise control sets Curtis apart from other controllers.
- Accelerating or decelerating, downhill or uphill, half-throttle or full-throttle, Curtis controllers enhance vehicle response with a difference you can feel.
- Curtis motor control software ensures the best throttle response and efficient motor drive.
- Environmental ruggedness and cool, reliable operation and our patented power electronic circuits are recognized as the industry's best.

A Record of Innovation

- Curtis set the pace for CAN technology, advanced system integration and created best-in-class SepEx® Separately Excited controllers.
- We pioneered the use of High Speed MOSFETS in low voltage, high power control.
- The new AC controllers series sets the industry standards for flexibility, performance, safety and reliability.

SYSTEM INTELLIGENCE - VCL

- The Curtis Vehicle Control Language – VCL – is an easy-to-use software programming language that allows software development specifically for each application.
- VCL offers flexibility to develop an integrated vehicle, with the ability to customize and differentiate it according to each unique requirement.
- The CAN bus physically connects the system and allows a virtual network of I/O, while reducing expenses associated with wiring and maintenance. Distributed logic and I/O unify the vehicle resource, making it available to the entire vehicle system.
- VCL works with Flash programmable memory to allow instant modifications at any development phase, from prototyping to final field testing. It all adds up to easier-than-ever vehicle upgrades. With VCL, it's simply a matter of programming!
- VCL includes CAN communications control, I/O functions, feedback-loop process blocks and software development tools. The combination enables virtually limitless customization.

PROGRAMMING AND SYSTEMS CONTROL

Model 1310 Vehicle System Controller

- The Vehicle Controller, Model 1310, extends dynamic system configuration with embedded VCL to other Curtis controllers.
- A single-point "Master" control of multiple vehicle functions which can be applied to electric vehicles, non-electric vehicles and stationary control systems
- Works in conjunction with Curtis CAN-based motor controllers and other CAN-open devices.

Model 1311 Handheld Programmer

- Provides simple and intuitive programming, testing and diagnosing of Curtis motor controllers and auxiliary devices.

Model 1314 PC Programming Station

- Powerful Windows® interface for adjusting settings, troubleshooting and recording the parameters of any Curtis product with a serial or CAN-bus interface.
- Compatible with microprocessor-based Curtis motor controllers and chargers.

CURTIS AC
MOTOR CONTROLLERS

- The new Curtis AC controller family delivers an exceptional level of sophistication and adaptability for vehicle designers and end-users.
- Curtis AC controllers come in compact, fully sealed housings.
- Highly efficient, with advanced thermal management for exceptionally cool operation.

Models 1230 and 1230S

Low-power AC controller. Ideal for electric pallet movers and other small electric vehicles.

- 24 V up to 150 A
- 24 V up to 200 A with optional CAN bus

Model 1234

Optimized for smaller industrial vehicles and larger pallet movers.
VCL and CAN optional package for advanced system designs.
Dual drive capability.

- 24 V up to 300 A
- 36-48 V up to 250 A

Model 1236

Mid-power AC controller with VCL and CAN; fully featured for a wide range of Material Handling and Industrial Vehicles including single/dual drive and pump control.

- 24-36 V up to 500 A
- 36-48 V up to 350 A
- 48-80 V up to 300 A

Model 1238

High-power AC controller with VCL and CAN; fully featured for a wide range of Material Handling and Industrial Vehicles including single/dual drive and pump control.

- 24-36 V up to 600 A
- 36-48 V up to 650 A
- 48-80 V up to 550 A

SepEx®
MOTOR CONTROLLERS

- Curtis motor controllers deliver smooth, silent and seamless control of separately excited DC motors.
- SepEx® motor controllers eliminate the need for reversing contactors and provide full regenerative braking to zero speed.
- Curtis' renowned MOSFET power sections, combined with a sophisticated microprocessor, provide high efficiency and flexibility.

Models 1243 and 1243 CAN

For pallet movers, order pickers and other medium-power material handling vehicles. CAN bus connectivity allows advanced vehicle control and integration.

- 24-36 V, 200-350 A

Models 1244 and 1244 CAN

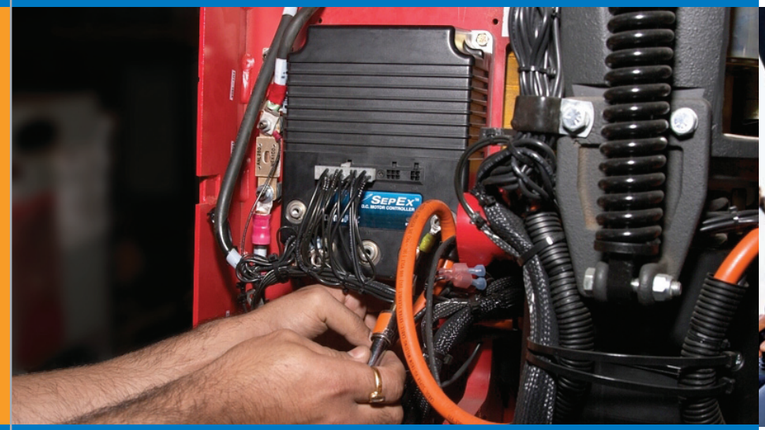
Ideal for reach trucks, counterbalance, larger pallet movers and other power demanding material handling vehicle applications. CAN bus connectivity allows advanced vehicle control and integration.

- 24-36 V, 400-700 A
- 36-48 V, 400-600 A
- 36-80 V, 400-600 A

Models 1254 and 1254 CAN

Full featured hydraulic system controller with drivers for the pump motor and lift / lower valves.

- 24-36 V, 400-700 A
- 36-48 V, 400-600 A
- 36-80 V, 400-600 A



Models 1266 and 1268

For heavy-duty golf / utility vehicles.

- 48 V, 275 A
- 36-48 V, 400 A and 500 A
- FLASH Memory

Model 1297

Integrated Traction & Hydraulic System Controller.

- 24 V, 150, 250 and 350 A with 200 or 300 A Series motor pump sections

PERMANENT MAGNET MOTOR CONTROLLERS

- Four-quadrant, full-bridge power MOSFET design provides superb speed and torque control, solid-state motor reversing and full braking power along with silent, high-frequency and efficient operation

Model 1210

Super compact

- 24 V 45 and 70 A

Models 1225 / 1235

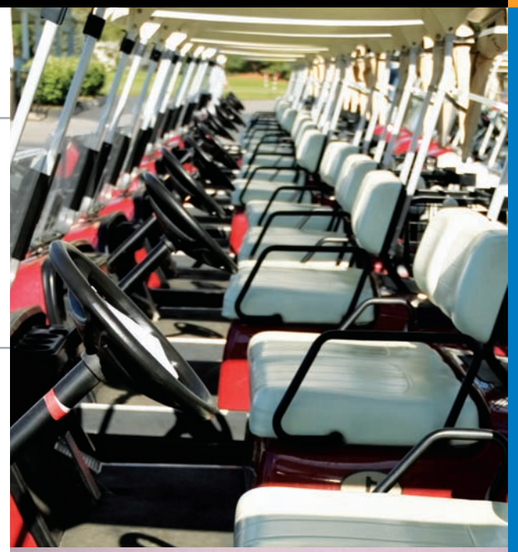
- 24 V, 65, 100 and 125 A
- 36 V, 90 A

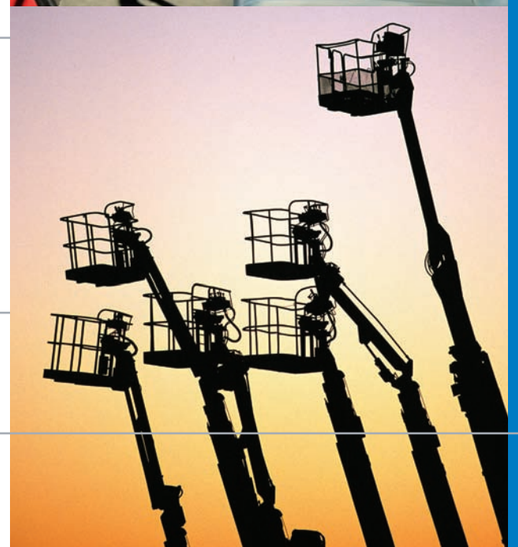
Models 1227 / 1237

- 24 V, 150 and 200 A
- 36 V, 125 and 160 A
- 48 V, 100 A

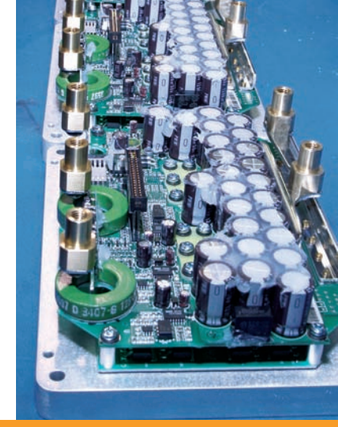
Models 1228 and 1228S

- 24 V, 70 and 110 A
- 36 V, 70 A





SERIES MOTOR CONTROLLERS



- Curtis Series MOSFET electronic controllers provide cost-effective speed and braking control.
- High-frequency switching and ultra-low voltage drops provide very high efficiency, and smooth, silent operation.

Model 1204

- 24-36 V, 175 and 275 A
- 36-48 V, 275 A

Model 1205

- 24-36 V, 400 A
- 36-48 V, 350 A
- 12 V, 400 A

Model 1207A

- 24 V 100-250 A, 110-300 A

  Microprocessor logic

Model 1209B

- 36-48 V, 450 A
- 48-72 V, 450 A

Model 1214

- 24-36 V, 400 A

  Microprocessor logic

Model 1215

- 36-48 V, 500 A

  Microprocessor logic

Model 1219

- 36-48 V, 600 A

  Microprocessor logic

Model 1221B

- 24-36 V, 600 A
- 36-48 V, 550 A
- 48-72 V, 500 A

PROGRAMMABLE INSTRUMENTATION

- A single gauge can be programmed with multiple functions based on your application with wide-ranging customization.
- These microprocessor instruments include digital and analog inputs and MOSFET outputs. This approach can be used to activate lift-lockout, engine shutdown, etc., and results in direct time and cost savings:
  - Lower overall stocking requirements.
  - Reduced installation time and labor.
  - Ease of ordering.
  - More opportunities for volume pricing and purchasing advantages.

enGage™
IC series™

SINGLE FUNCTION

enGage™ I

- An hour meter in module format or in a compact package for small industrial vehicles utilizing proven Curtis technology at exceptional value and low overall cost.
- IP 65 housings with a hexagonal or rectangular face.
- Sealed Packard connector or quick-disconnect terminals.
- Convenient mounting clip makes installation a snap. Simply place the gauge in the standard cutout, slide on the mounting clip and install the connector.

MID-RANGE enGage™ II *(Dual Function)* & enGage™ III

(Up to three functions with additional display advisories)

- Microprocessor-based.
- Can be factory or user programmed to monitor various functions.
- Functions can be selected in virtually any combination to meet any vehicle and equipment application requirements.
- Gauge function options include: fuel, temperature, pressure, voltage, tachometer, hour meter, settable hour meter and field-programmable maintenance monitor.

Shown with optional backlit display

Model 3100R

- Can be used with any CAN open enabled speed controller.
- Attractive, easy-to-read, 8 character dot matrix Liquid Crystal Display enhances the look of any vehicle.
- LCD contains bargraph and alpha numeric sections for viewing operational status and system codes.
- Requires substantially less wiring while providing increased access to system information.

YOU CONFIGURE THEM

enGage™ II & III

1. Select the Functions (2 or 3 respectively)

- Pick from: fuel, temperature, pressure, voltage, maintenance monitor, settable hour meter, battery discharge indicator, tachometer and hour meter.

2. Choose the Housing

- enGage™ II – 52 mm round.
- enGage™ III – 50 x 100 mm.

3. Select the Display

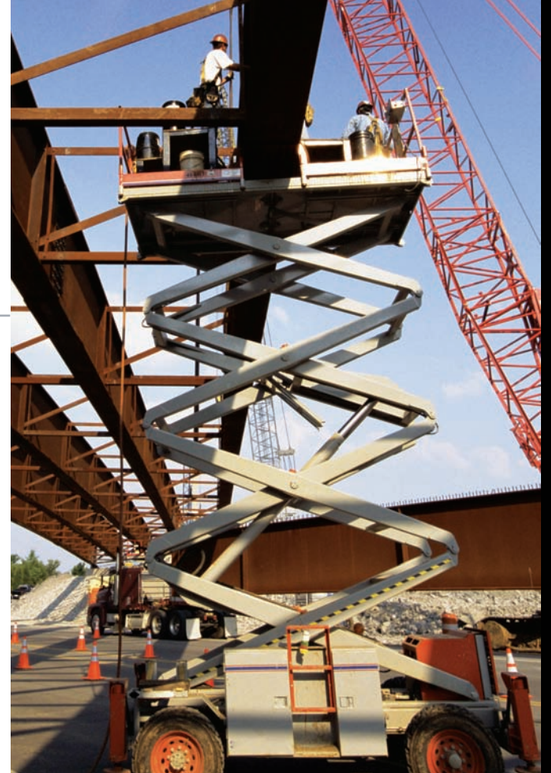
- Display any of the selected functions as bargraph or numeric, in any combination, mix and match.
- Choose up to 8 warning icons (enGage™ III).
- Pick standard ISO/SAE icons or design your own.

TOP OF THE LINE

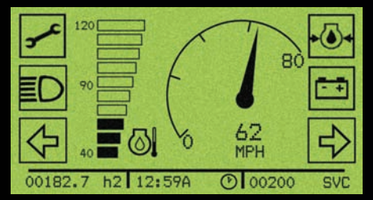
enGage™ IV *(Four Functions)*

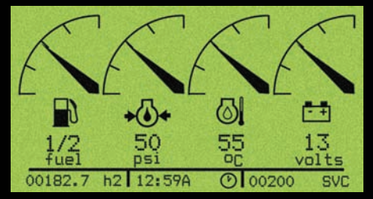
- The flexibility and advanced functionality of a custom instrument panel in one housing.
- CAN (SAE J1939, Open) or standard models available.
- Dot matrix display.
- Select each display element and its location.
- Custom-configured display options include bargraph, numeric display, needle display and message center.
- Accommodates up to four gauge functions, plus additional on-off indicators.
- Can be customized with the OEM's logo or virtually any other desired graphics.
- Even the display icons can be custom designed.
- Allows "at-a-glance" determination of vehicle status.
- Front panel buttons can be used to initiate CAN commands to the vehicle controller.

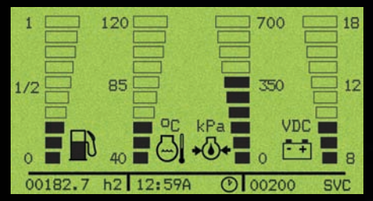
enGage™ IV

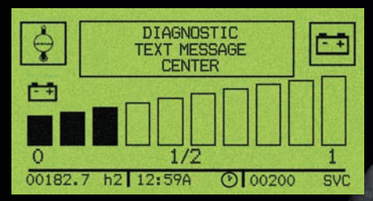


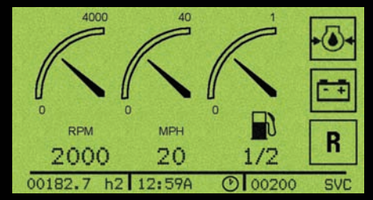
YOU DESIGN IT WITH GREATER FLEXIBILITY











- Design a custom panel using a broad palette of possibilities.
- Choose from a wide range of functions, display styles (bargraph, numeric, pointer, needle) and graphics – to easily customize the perfect panel for your specific application.
- In addition to gauge functions, the displays can include multiple warning icons and an advisory line for hour meters, maintenance monitors and time-of-day clock.

HOUR METERS AND COUNTERS

Cased 700 Series

- Highly reliable solid-state hour meters and counters provide unprecedented performance, reliability and value.
- Ideal for scheduled maintenance, warranty and lease monitoring.
- Non-volatile EEPROM memory.
- Wide voltage ranges minimize worldwide stocking requirements.
- Many case styles to fit in all types of standard hour meter/counter cutouts.
- The right model for every application:
  - Model 700: 2-wire hour meter displays only when powered. AC/DC.
  - Model 701: 3-wire hour meter has provision for continuous display. AC/DC and DC.
  - Model 703: Pulse counter. AC/DC and DC.
  - 6-digit LCD, 5 mm or 7 mm digits (7 mm with optional backlighting).

700 Series Modules

- Wide selection of miniature AC & DC modules for PC board mounting in a variety of sizes, voltages and customizable options to fit most applications.
- Ideal for OEMs, contract manufacturers and panel makers.
- Non-volatile EEPROM memory.
- Silent operation with no moving parts.
- The right model for every application:
  - Models 700 to 703: Single-function 6-digit display for counters and hour meters.
  - Models 708 to 721: Dual channel, 6- and 7-digit displays for maintenance/hour meter or trip odometer configurations.
  - Model 720: Single channel 7-digit odometer.
  - 6-digit LCD, 5 mm or 7 mm digits (7 mm with optional backlighting).

BATTERY DISCHARGE INDICATORS AND COMBINATION GAUGES

Model 803

Battery Discharge Indicator / Hour Meter with Lift Lockout

- Combines in one instrument a completely solid-state battery discharge indicator, an LCD hour meter and lift lockout, housed in a 52-mm case.
- Indicates state-of-charge in 10-bar LED display.
- With no moving parts, this instrument is exceptionally reliable even in severe operating environments.
- Suitable for all electric vehicles.
- Programmable for extreme discharge rates.

Model 840

Battery Discharge Indicator with “Push-to-Read” Hour Meter

- Indicates various system parameters such as battery state-of-charge, operating hours or maintenance status.
- Communicates directly with Curtis motor controller Model 1297 or other serial communication device.
- Ideal for material handling and order pickers and other equipment.
- Displays data using a dedicated unidirectional asynchronous serial signal.
- 8-character dot matrix LCD.
- Choice of 3 or 6 warning LEDs with optional backlighting and freezer versions.

Model 841

Vehicle Controller Monitor

- Attractive, easy-to-read, 8 character dot matrix Liquid Crystal Display enhances the look of any vehicle.
- Standard models display hours of use, battery state-of-charge and fault code messages from a Curtis motor speed controller.
- Front sealed (IP65) for use in harsh environments.

Model 906

Battery Discharge Indicator

- Battery “Fuel Gauge” indicates state-of-charge in 10-bar LED display.
- Solid-state. Easy to install.
- Ideal for golf cars, commercial cleaning equipment, mobility aids, electric bicycles, electric marine motors, medical devices and many other applications
- Available in five panel-mount packages and a printed circuit board mounted module.

POWER CONVERSION
DC/DC CONVERTERS

- Curtis DC/DC Converters offer precise regulated voltage outputs to provide power to auxiliary electric circuits on an electrical vehicle.
- Ideal for driving lamps, computer terminals, communication equipment or charging auxiliary batteries.
- Unmatched efficiency with superior thermal protection.
- Safety is assured by dielectrically isolated output, thermal protection, transient protection and reverse polarity protection.
- Prevents battery damage and unsafe installations caused by tapping the battery directly.

1400 Series DC/DC Converters

Available in both 250 W peak (Model 1410) and 375 W peak (Model 1400) ratings.

- Volt Input: 24 to 96 V
- Volt Output: 12, 13.5, 24, 28 V

BATTERY CHARGERS

- Curtis switch-mode portable chargers allow for easy high-frequency charging of 12 and 24 V electric vehicle batteries at any outlet.
- Safely recover deeply discharged batteries and protect them from overcharging.
- Users can program the charger profile optimum for a specific battery.
- Microprocessor control and switch-mode operation allow for faster charging of all types of lead-acid batteries.
- Lightweight and compact.

Model 1608FS

Portable. Switch-mode. For opportunity charging of walkies & pallet trucks

- Cooling: Fan
- Sealing: IP 54 electronics, IP 30 fan
- Input Voltage: 100-240 VAC
- Output Voltage: 24 VDC

Model 1620

Portable. Switch-mode. Ideal for order pickers, walkies, pallet trucks, reach trucks, scrubbers, stackers, sweepers and tugs

- Cooling: Fan
- Sealing: IP 54 electronics & fan
- Input Voltage: 120 VAC (1620FS-120/24/20-001)
  230 VAC (1620FS-230/24/20-001)
- Output Voltage: 24 VDC

WARNING DEVICES

Beacons

- 12 V to 80 V range of high-efficiency xenon visual warning lights.
- Operating temperatures from –40° to +77°C.
- Universal mounting base.
- Encapsulated electronics.
- Replaceable Xenon tube.

Alarms

- Available in 12 V to 72 V with output of 87 to 97 dB.
- 12 V to 48 V is available with output between 82 dB and 107 dB.
- Environmentally protected for indoor or outdoor use.

DC CONTACTORS & DISCONNECT SWITCHES

DC Contactors

- High-quality Curtis/Albright contactors for vehicle and industrial applications are available at ratings of 100, 125, 150 and 250 A.
- Millions are in use worldwide, proven in the toughest conditions.
- Built for reliability, these units feature high continuous ratings in compact, durable packages.
- Coils are available from 6 to 240 V.

Emergency Disconnect Switches

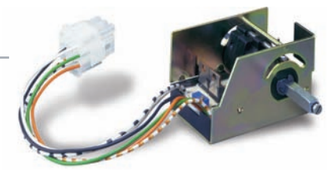
- Reliable double-pole and single-pole disconnect switches provide a rapid means of manually disconnecting batteries – or other power supplies – in the event of serious electrical faults.

INPUT DEVICES

Foot Pedals

- Ideal for tough environments such as material handling, Curtis foot pedals are used with Curtis electronic motor speed controllers, as well as models by other manufacturers.
- Designed for maximum installation flexibility and durability, these pedals are made of rugged aluminum castings.

Electronic Throttle Assemblies



- Provide a voltage or resistive output proportional to throttle position as an input to a Curtis motor controller.
- Ideal for rugged environments, as major components are encapsulated to protect them from environmental stresses.
- Hall-effect technology and solid-state contactor drivers provide high reliability.

Pot Assemblies

- Wig-Wag throttles which provide an output for motion in both directions. A conductive plastic element in conjunction with unique wiper and shaft support design provides a durable throttle with longer mechanical life.

Tiller Heads

- Attractive, ergonomic and practical function control handles used in pallet jacks, walkie-stackers and tow tractors.
- These tiller heads include an electronic throttle mechanism and an emergency switch, and may be equipped with a variety of functional options, including switches (horn, lift, lower, coast), throttle (butterfly, twist-grip) and instrumentation.

CUSTOMER SUPPORT

WARRANTY

Curtis warrants all its products to be free from defects in materials and workmanship for two years from the date of manufacture, subject to the terms and conditions of a Limited Warranty. Curtis will replace the defective product at no cost to the customer, except for transportation. Replacement means furnishing the customer with a new or reconditioned product equivalent to the original product. See the general Curtis warranty policy for details.

SERVICE

Curtis customers can count on the company's extensive worldwide service structure to provide the highest level of customer support and technical assistance.

CUSTOMIZATION

Curtis products are fully programmable and designed for maximum application flexibility. In cases where the present product offering does not fully meet specifications, or when OEMs require special customization, Curtis product development can meet the challenge. Contact your Curtis representative to discuss your specific projects.

ISO

Curtis Instruments Inc. is an ISO 9001:2000 registered company. The company is actively working toward ISO 14000 certification.

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